

Analytix

Advances in Analytical Chemistry

Issue 1 • 2005



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Shell Indicators in Cocoa Products

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SIGMA-ALDRICH

Hyphenation Hype or fascination?



Picture Fabian Wahl, PhD
Manager R&D, Europe

Dear Colleague,

Analytical science is rife with acronyms, abbreviations and hyphenations. Usually these are shortcuts used by scientists and technical writers to describe complex techniques and instrumentation. The appeal of a hyphenated approach, i.e. the combination of different analytical techniques used in series, is that it allows to cross two hurdles with one leap. The combined power of the two (or more) techniques is applied to solve difficult analytical problems and often, the information obtained from a hyphenated technique is greater than the sum of the individual components without hyphenation. But making sense of and, indeed, keeping track of new hyphenated techniques reported in the literature can be tedious.

The focus of this issue of the Analytix is LC-NMR: the hyphenation of HPLC, a ubiquitous and powerful separation technique, with one of the most valuable spectroscopic detection methods, NMR, known for its

ability to provide unique structural information. Each quarter in Analytix we will identify a new hyphenated technique from the literature and allow you to ask the question *Hyphenation: hype or fascination?*

What can we do for you?

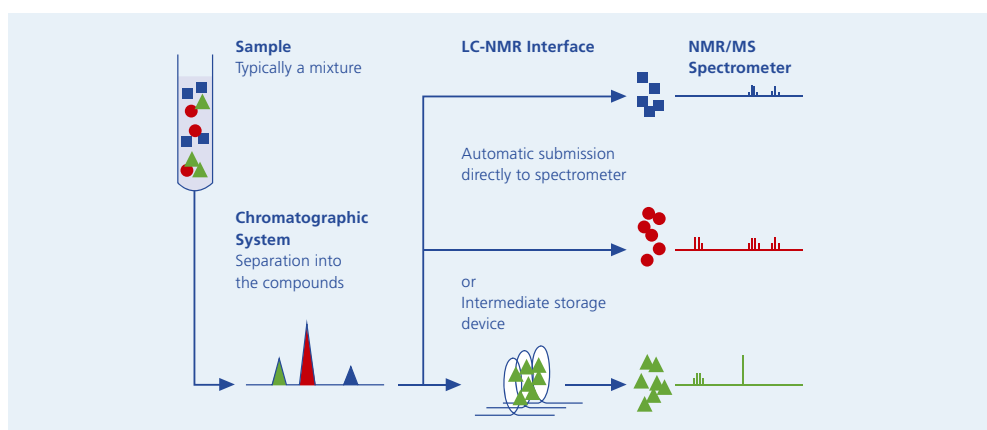
If you would like to find out whether the combined analytical expertise of scientists in our Fluka, Riedel-de Haën and Supelco brands can help solve your most challenging analytical problem, please contact our Technical Service Team using the contact data on the back page. Our chemists enjoy being challenged by your questions!

I sincerely hope that you find this issue of Analytix both interesting and useful.

Respectfully,

Fabian Wahl, PhD
Manager R&D, Europe
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Figure Flow System in LC-NMR/MS
(Source: Bruker BioSpin GmbH)



Feature article

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New Standards for Food Analysis Fatty acid tryptamides as shell indicators in cocoa products.

By Rainer Walz
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The first stage in transforming cocoa beans to chocolate or other cocoa products involves preparation of the bean: cleaning, shelling, winnowing and roasting. After this stage, the roasted "nib" is processed to chocolate liquor which is then further processed to the familiar cocoa butter and cocoa powder. Insufficient removal of shell material from the cocoa beans reduces the quality of the final chocolate product. Shell contamination can be directly measured by monitoring the presence of certain fatty acid tryptamides (FAT) that predominate in cocoa shells (1,2,3). Chemists at Sigma-Aldrich's Fluka facility have developed an innovative method to extract nine unique FAT compounds from cocoa shells and provide them in pure form.

FAT Determination

Electrospray-mass spectrometry and ¹H-NMR were used to identify tetracosanoyl-2-(3-indolyl)ethane amide (lignoceric acid tryptamide; **LAT**) and docosanoyl-2-(3-indolyl)ethane amide (behenic acid tryptamide; **BAT**) as the most prevalent FAT compounds in cocoa shells. The presence of naturally occurring LAT and BAT was confirmed by structural comparison with synthetic compounds. By using synthetic heptadecanoyl-2-(3-indolyl)ethane amide (margaric acid tryptamide; **MAT**) as the internal standard, a sensitive and reproducible method was developed for the quantification of **LAT** and **BAT** at picogram (pg) levels using HPLC with fluorescence detection. The detection limit was determined to be 30 pg. Authentic cocoa shell samples contained 50-fold higher concentration of BAT and LAT than did the cocoa endosperm. In fifteen commercial chocolate samples, combined concentration of BAT and LAT were found to range from 23.1 µg to 63.0 µg per g of cocoa fat.

Table 1 shows the BAT and LAT concentrations from several commercial chocolate samples performed by two different analytical laboratories using the HPLC method and these FAT standards (1,2,3).

Sample	BAT (µg/g)		LAT (µg/g)	
	Lab A	Lab B	Lab A	Lab B
White Chocolate	5.05	5.04	10.7	10.4
Milk Chocolate	4.21	4.34	9.30	9.43
	4.41	4.54	9.12	9.00
	3.76	3.61	7.35	7.07
Bitter Chocolate	4.51	4.53	9.06	9.07
	6.05	6.09	13.1	12.7
	6.77	6.79	13.3	13.4

Table 1 Concentrations of BAT and LAT in commercial chocolate samples (data adapted from (1))



Picture Fluka Assorted Swiss Chocolates

Special Offer:

Order any Fluka FAT standard and receive a free sample of our famous Fluka Swiss Chocolate. Use it for analysis or for enjoyment!

Please quote Promotion Code 981 when placing your order. Offer valid until 30th of April 2005.

Fluka FAT Standards

Fluka is pleased to offer the first five unique fatty acid tryptamides in analytical standard quality.

Cat. No.	Brand	Name	Synonym	Package Sizes
12094	Fluka	Docosanoic acid tryptamides (Behenic acid tryptamide) (C22:0) One of the most prominent tryptamides in cocoa shells and cotyledons (seed leaf)	BAT	25 mg and 100 mg
00864	Fluka	Hexacosanoic acid tryptamide (Cerotic acid tryptamide) (C26:0) Also present in cocoa shells and cotyledons	CAT	25 mg and 100 mg
07347	Fluka	Tetracosanoic acid tryptamide (Lignoceric acid tryptamide) (C24:0) On of the most prominent tryptamides in cocoa shells and cotyledons	LAT	25 mg and 100 mg
41905	Fluka	Heptadecanoic acid tryptamide (Margaric acid tryptamide) (C17:0) Internal standard for the determination in cocoa products by HPLC	MAT	25 mg and 100 mg
56924	Fluka	Tricosanoic acid tryptamide (C23:0) Also present in cocoa shells and cotyledons	TAT	25 mg and 100 mg

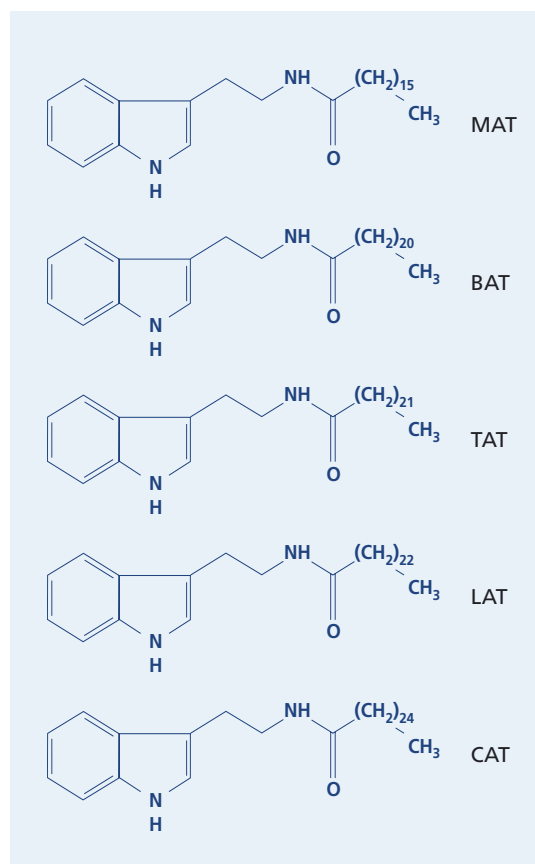
Table FAT Standards



Picture Chocolate

References

- (1) Münch, M; Schieberle, P; Janßen, K; Raters, M; Matissek, R (2000) Schnellmethode zur Erfassung des Schalenanteils in Kakaoprodukten über Fettsäuretryptamide als Indikatorverbindungen. Süßwaren 43 (9): 28-31
- (2) Janßen, K; Raters, M; Matissek, R; Münch, M; Schieberle, P (2001) Zur Bestimmung des Schalenanteils in Kakaoprodukten: Vergleich der „Blauwert-Methode“ mit einem neuen HPLC-Verfahren. Lebensmittelchemie 55 (1) 5-6
- (3) Janßen, K; Matissek, R (2002) Fatty acid tryptamides as shell indicators for cocoa products and as quality parameters for cocoa butter. Eur Food Res Technol 214: 259-264



Picture Structures of several of the most common FAT

New IRMM Certified Reference Materials for GMO Maize Two additions to IRMM product offering of GMO standards.

By Kurt Vorburger
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Picture

Analytix Labinfo:
IRMM Certified GMO
Standards (HTM)

Maize GA21 and NK603

Tracking the environmental fate of genetically modified organisms (GMO) is a contemporary analytical challenge. Reliable, certified standards are required for proper identification and quantification in food, feedstuff and the environment. We have recently expanded our extensive line of IRMM (Institute for Reference Materials and Measurements) standards to include dried flour containing different mass fractions of two varieties of GMO-derived maize, GA21 and NK603. Both are Roundup Ready® varieties developed by Monsanto (St. Louis, MO, USA). These new GMO standards complement other IRMM standards and

those required for the 2004 EC guidelines for food safety we already offer. The standards comprise non-GMO dried maize powder containing approximately 0, 0.1, 0.5, 1, 2 and 5% by weight of the two different GMO maize varieties. The non-GMO raw material is from whole kernels of a non-modified maize line. Homogeneity is assured by the use of a dry-mixing technique, which also minimizes DNA and protein degradation during production. The GMO maize CRMs are provided in glass bottles containing 1 g of dried maize powder packed under argon atmosphere.

Sigma-Aldrich through its Fluka brand, also offers Maize Bt-176 "Maximizer", Bt-11 and MON 810 "YieldGard" and Soya Roundup Ready®. For a complete list of the IRMM GMO standards offered by Sigma-Aldrich, please request Analytix Labinfo: IRMM Certified GMO Standards. Send back the enclosed reply card or download it from www.sigma-aldrich.com/analytix.

Table 1 GMO Maize GA21 Certified Standards (IRMM-414)

Cat. No.	Brand	Cert. Ref. Material	IRMM Ref. No. (ERM® Brand)	% w/w GMO*	Certified GMO mass fraction	Quantity
06683	Fluka	Maize GA21 Powder Set	IRMM-414	0%, 0.1%, 0.5%, 1%, 2%, 5% GMO Maize GA21		1 set (1 gram each)
68362	Fluka	Maize GA21 Powder	IRMM-414-0	0% (<0.08%) GMO Maize GA21	<0.8 g GMO/kg	1 gram
48931	Fluka	Maize GA21 Powder	IRMM-414-1	0.1% GMO Maize GA21	1.0 g GMO/kg	1 gram
49316	Fluka	Maize GA21 Powder	IRMM-414-2	0.49% GMO Maize GA21	4.9 g GMO/kg	1 gram
63485	Fluka	Maize GA21 Powder	IRMM-414-3	0.99% GMO Maize GA21	9.9 g GMO/kg	1 gram
11772	Fluka	Maize GA21 Powder	IRMM-414-4	1.72% GMO Maize GA21	17.2 g GMO/kg	1 gram
43214	Fluka	Maize GA21 Powder	IRMM-414-5	4.29% GMO Maize GA21	42.9 g GMO/kg	1 gram

* The diluent powder and the 0% standard are <0.08% w/w GMO Maize GA21

Table 2 GMO Maize NK603 Certified Standards

Cat. No.	Brand	Cert. Ref. Material	IRMM Ref. No. (ERM® Brand)	% w/w GMO*	Certified GMO mass fraction	Quantity
06943	Fluka	Maize NK603 Powder Set	IRMM-415	0%, 0.1%, 0.5%, 1%, 2%, 5% GMO Maize NK603		1 set (1 gram each)
63486	Fluka	Maize NK603 Powder	IRMM-415-0	0% (<0.04%) GMO Maize NK603	<0.4 g GMO/kg	1 gram
44826	Fluka	Maize NK603 Powder	IRMM-415-1	0.1% GMO Maize NK603	1.0 g GMO/kg	1 gram
49827	Fluka	Maize NK603 Powder	IRMM-415-2	0.49% GMO Maize NK603	4.9 g GMO/kg	1 gram
67156	Fluka	Maize NK603 Powder	IRMM-415-3	0.98% GMO Maize NK603	9.8 g GMO/kg	1 gram
61782	New	Maize NK603 Powder	IRMM-415-4	1.96% GMO Maize NK603	19.6 g GMO/kg	1 gram
53226	New	Maize NK603 Powder	IRMM-415-5	4.91% GMO Maize NK603	49.1g GMO/kg	1 gram

* The diluent powder and the 0% standard are <0.04% w/w GMO Maize NK603

New Environmental Standards Improved formulations for the most popular analyses.

By Vicki Yearick.....
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Supelco is pleased to introduce 300 new analytical standards for environmental analyses. These new formulations resulted from working closely with key customers to develop environmental standards that provide better solutions for the most commonly employed analyses. The new formulations include volatiles, pesticides, herbicides, semi-volatiles, aroclors and hydrocarbons. They are designed for use with current US EPA 500, 600, and 8000 series and CLP methods. They are being offered in an assortment of neat, single component and multi-component solutions and kits.

Quality built into every product

These new environmental standards are manufactured using the same quality processes and practices that we employ for all of our chemical standard products.

- Only the highest purity raw materials are used: most are $\geq 99\%$.
- Precise gravimetric measurements and volumetric dispensing tolerances no greater than 0.5% of target is accepted.
- Gravimetric measurements are made on balances that have been calibrated with NIST traceable weights.
- Quantitative testing is performed by GC or HPLC using a reference batch method.
- Shelf life is determined by both accelerated and real-time stability studies.

Certification and documentation

Each standard is backed by certification and documentation.

- A certificate of analysis (COA) summarizes the QA analysis of the final product for purity, component identity and concentration.
- Certificate of composition (COC) provides a summary of gravimetric preparation of the final product.
- A 16 Chapter MSDS is provided with the first purchase of each product.
- Data packets are available at no charge upon request.
- Online COAs can be accessed anytime at no charge through our website www.sigma-aldrich.com.

Separate Source Standards

This new standards line includes over two dozen Separate Source Standards. Separate Source products have identical formulations, but are prepared from independently sourced raw materials and are independently quality controlled. An example is shown in **Figure 1**. These standards provide the convenience of working with Supelco as a single vendor while enabling you to meet independent audit requirements of the US EPA.

Table Selection of Environmental Standards

Cat. No.	Brand	Description	Pack Size
861143	Supelco	Semi-Vol Acid/Base Surrogate Spike (low)	1 x 100 mL
861217	Supelco	B/N Calibration Mix 2 (2 nd lot), CH ₂ Cl ₂ 2000 µg/mL	1 x 5 mL
861238	Supelco	8270 Internal Standard Mix 2, Benzene: CH ₂ Cl ₂ (50:50)	1 x 100 mL
861220	Supelco	Acid Calibration Mix 2 (2 nd lot), CH ₂ Cl ₂ 2000 µg/mL	1 x 5 mL
861218	Supelco	Acid Calibration Mix 1 (2 nd lot), CH ₂ Cl ₂ 2000 µg/mL	1 x 5 mL
861231	Supelco	CLP OLM04 SV Mix (2 nd lot), CH ₂ Cl ₂ 2000 µg/mL	1 x 2 mL
861386-U	Supelco	Acid Herbicide Spiking Mix, MeOH varied Concentration	1 x 1 mL
8561337	Supelco	SS 8270 Calibration Kit	9 Ampules
861142	Supelco	Semi-Vol Acid/Base Surrogate Spike (high)	1 x 100 mL
861249	Supelco	8270 Acid Surrogate Mix 1, MeOH 2000 µg/mL	1 x 100 mL
5500720	Supelco	SS 8270 Calib Mix 1, CH ₂ Cl ₂ : Benzene (75:25) 1000 µg/	1 x 1 mL
5M07296	Supelco	Semivolatile Internal Standard Mix, CH ₂ Cl ₂ 2000 µg/mL	5 x 1 mL
861377	Supelco	8270 B/N Surrogate Mix 1, CH ₂ Cl ₂ 5 mg/mL	5 x 5 mL
861309	Supelco	8260 Mix 6, MeOH varied concentrations	1 x 1 mL

Pricing

We've priced these new environmental standards to be very competitive, giving you both high quality and exceptional value. We invite you to take a look at the price advantages offered by the larger volume package sizes.

For a copy of the new environmental standards product portfolio, visit our website www.sigma-aldrich.com/env_std

1. Hexane
2. Heptane
3. n-Octane
4. n-Nonane
5. n-Decane
6. n-Undecane
7. n-Dodecane
8. n-Tetradecane
9. n-Hexadecane
10. n-Octadecane
11. n-Eicosane
12. n-Tetracosane
13. n-Octacosane
14. n-Dotriacontane
15. n-Tetratetracontane
16. n-Hexatriacontane
17. n-Tetracontane

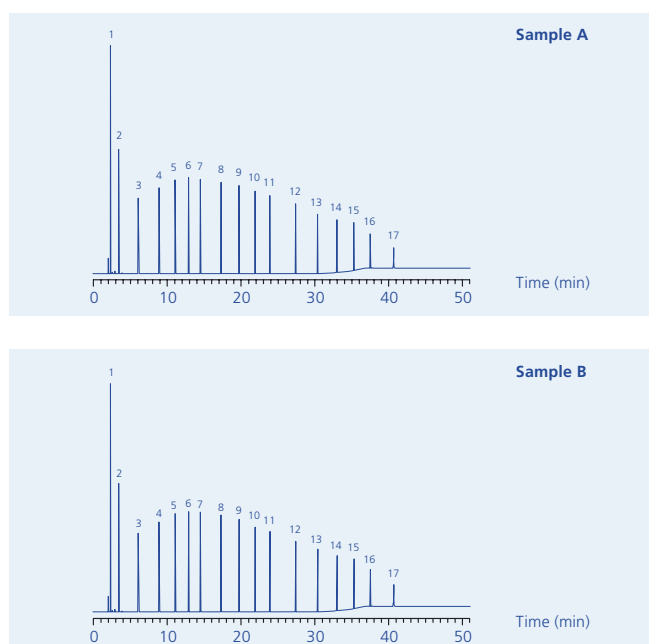


Figure 1 Separate Source Total Petroleum Hydrocarbon (TPH) Standards

Sample A: TPH Mix 3, 1000 µg/mL each in CS₂ (861394-U)

Sample B: TPH Mix 3, 1000 µg/mL each in CS₂ (8561394-U)

Column: Equity-5, 60 m x 0.53 mm I.D., 0.5 µm (28263-U)

Oven: 40°C (5 min.) to 350 °C (20 min. hold) @ 10°C/min

Inj.: 250°C

Det.: 360°C

Carrier gas: Helium

Injection: 1.0 µL, direct on-column

CHROMASOLV® Solvents Sigma-Aldrich's extensive line of high purity solvents for the most demanding HPLC, LC-MS, LC-NMR and AMD applications.

By **Frederik Pillong**

fpillong@sial.com

Analytical chemists rely on Sigma-Aldrich for high quality standards, columns and reagents for HPLC and spectroscopy. However, using poor quality mobile phase solvents can seriously jeopardize or nullify the quality of the analytical results, result in loss of valuable sample information and cause expensive instrument downtime. To complement our high quality standards, columns and reagents, we developed the **CHROMASOLV®** line of solvents and blends for HPLC, LC-MS, LC-NMR and AMD. Competitively priced and tested for suitability in situ, these high purity solvents are an exceptional value and belong in every serious analytical laboratory.

CHROMASOLV® solvents for HPLC

CHROMASOLV® provides minimal HPLC baselines, even at very low UV wavelengths, and clean preparative separations.

The HPLC **CHROMASOLV®** product range includes the most commonly employed reversed- and normal-phase mobile phase solvents, including water, acetonitrile, methanol, ethyl acetate, isopropanol, THF and many others. Besides offering a wide choice of solvents, the HPLC **CHROMASOLV®** product groups are designed for specific HPLC applications: low UV, isocratic, gradient, routine and preparative.

CHROMASOLV® HPLC solvents are lot-tested and precisely controlled to ensure application compatibility and successful separations. Some important test parameters include:

- High UV transmittance at low wavelengths for max. sensitivity
- Absence of gradient baseline and impurity peaks
- Low native fluorescence for enhanced sensitivity
- Controlled low content of non-volatile components like water, free acid and free alkali for preparative separations and reducing wear on pump components
- Low particulate matter ideal for preparative separations
- No need to pre-filter

HPLC CHROMASOLV® Product Groups

G CHROMASOLV® has the most stringent UV transmittance specifications. It was designed for sensitive gradient elution at low UV wavelengths, analyses with very high UV transmittance requirements and sensitive fluorescence measurements.

CHROMASOLV® solvents have low UV absorbance, low levels of interfering peaks and baseline drift in gradient mode, low non-volatile components, low levels of free acid and free alkali and very low water content. It is also ideal for sensitive fluorescence detection. This product group is the largest in the **CHROMASOLV®** line.

E CHROMASOLV® is suitable for isocratic analyses with low UV detection, gradients at 254 nm and fluorescence applications.

R CHROMASOLV® is suitable for isocratic analysis or gradients at 254 nm making it ideal for routine analysis.

P CHROMASOLV® solvents for preparative LC contain no impurities or particles that could end up in the purified sample fraction. Using these high purity solvents gives you the cleanest possible preps.

LC-MS CHROMASOLV® solvents and solvent blends

LC-MS **CHROMASOLV®** high purity solvents deliver stable, minimal LC-MS baselines. Convenient pre-mixed blends are easy to use and reduce variability due to mixing.

LC-MS is a powerful analytical tool because of its sensitivity and specificity. However, its performance can be compromised by impurities and particles in the mobile phase solvents. The LC-MS **CHROMASOLV®** product range was developed to provide maximum sensitivity and system lifetime from LC-MS analyses. The line comprises the most commonly used pure solvents, including water, acetonitrile and methanol, and convenient pre-blended solvent mixtures containing ultra-pure volatile ionic additives, like TFA, ammonium acetate, acetic acid and formic acid.

LC-MS **CHROMASOLV®** solvents and solvent blends undergo 34 quality tests to ensure they meet the stringent criteria required for sensitive LC-MS analyses. Some of the most important features are:

- Application-tested for LC-MS using the reserpine test

- Very low level of inorganic and metal ions for high sensitivity and spectral interpretation
- Low levels of alkaline impurities that can form clusters with the analyte, especially when using electro spray ionization
- Free of particles and non-volatile compounds to maintain system integrity and prevent column fouling
- Negligible gradient baseline rise

CHROMASOLV® solvents for LC-NMR

LC-NMR **CHROMASOLV®** solvents lack proton-containing contaminants that interfere with ¹H-NMR detection.

HPLC separations coupled with NMR spectroscopy provide valuable structural information not attainable with other detection modes, even MS. Because NMR detection typically requires expensive deuterated solvents, conventional HPLC mobile phases cannot be used. Also, HPLC-grade acetonitrile, a common reversed-phase organic modifier, contains proton-containing impurities like propionitrile. While not a problem in UV detection, proton-containing impurities interfere with NMR detection. We designed LC-NMR **CHROMASOLV®** acetonitrile to meet the purity requirements for LC-NMR. It contributes no ¹H-NMR signals that exceed the size of methyl signals (more than 5% at 3.78 ppm NMR of 0.0006% trimethoxybenzene) under typical LC-NMR conditions.

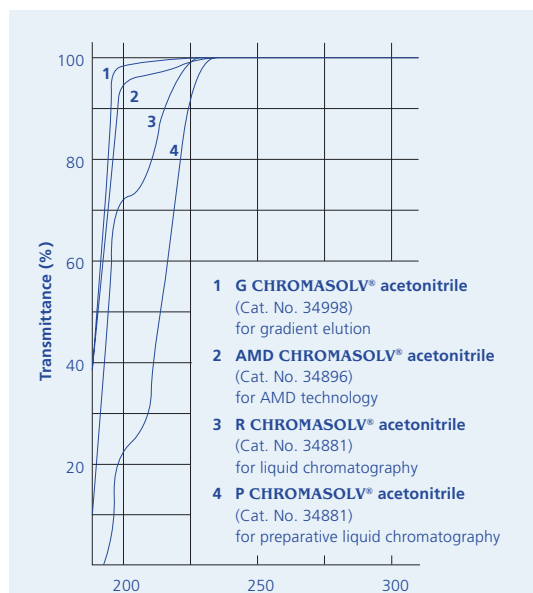


Figure **CHROMASOLV®** Product Groups:

Transmittance comparison

CHROMASOLV® Solvents for AMD Technology

AMD CHROMASOLV® solvents are free of nonvolatile compounds, specially UV absorbing residues. Automated Multiple Development technology is a fully automated, flexible and versatile separation technique used in thin layer chromatography. Due to its sensitivity, even small amounts of impurities (e.g. UV-light absorbing compounds) will cause interfering peaks and thus disturb the densitometry. Therefore, all solvents used as mobile phases, conditioning liquids, extraction liquids, and for TLC plates prewashing must be free of nonvolatiles, especially UV absorbing residues.

Selected CHROMASOLV® Products

Don't risk your sensitive analyses by using poor quality solvent. Look to the analytical experts at Sigma-Aldrich for all your high purity solvent requirements. The following tables present some of our most popular CHROMASOLV® solvents and solvent blends.

Test Products: LC/MS CHROMASOLV® Products for You to Test Drive

LC/MS CHROMASOLV® line of solvents and blends is competitively priced and tested for suitability *in situ*. These high purity solvents are an exceptional value and belong in every serious analytical laboratory.

Find out if the LC-MS CHROMASOLV® suits your most demanding needs of LC-MS solvents by taking advantage of our free, no obligation evaluation.

Order free of charge any product from **Table 2 and 3**, quoting the Promotion Code 957. Offer valid until 30th of April 2005. Offer limited to only one unit per customer.

Table 1 HPLC CHROMASOLV®

Cat. No.	Brand	Product Group	Description	Specifications	Package Size
34851	Riedel-de Haën	G CHROMASOLV®	Acetonitrile	Gradient grade, min 99.9%	1 L, 2.5 L, 7 L, 18 L, 45 L, 200 L
34881	Riedel-de Haën	R CHROMASOLV®	Acetonitrile	Far UV, min 99.8%	1 L, 2.5 L, 7 L, 18 L, 45 L, 200 L
34888	Riedel-de Haën	E CHROMASOLV®	Acetonitrile	far UV, min 99.9%	1 L, 2.5 L, 18 L
34998	Riedel-de Haën	G CHROMASOLV®	Acetonitrile	super gradient grade, min 99.9%	1 L, 2.5 L, 7 L, 18 L, 45 L, 200 L

Table 2 LC-MS CHROMASOLV® Pure Solvents

Cat. No.	Brand	Solvent	Specifications	Package Size
34967	Riedel-de Haën	Acetonitrile	min 99.9%	1 L, 2.5 L
34966	Riedel-de Haën	Methanol	min 99.9%	1 L, 2.5 L
39253	Riedel-de Haën	Water		1 L
34965	Riedel-de Haën	2-Propanol	min 99.9%	1 L, 2.5 L
34972	Riedel-de Haën	Ethyl acetate	min 99.7%	1 L, 2.5 L

Table 3 LC-MS CHROMASOLV® Blends

Cat. No.	Brand	Solvent	Specifications	Package Size
34668	Riedel-de Haën	Acetonitrile with 0.1% Formic Acid		2.5 L
34673	Riedel-de Haën	Water with 0.1% Formic Acid		2.5 L

Table 4 LC-NMR CHROMASOLV®

Cat. No.	Brand	Solvent	Specifications	Package Size
34955	Riedel-de Haën	Acetonitrile	min 99.9%	0.5 L, 1 L

Table 5 AMD CHROMASOLV®

Cat. No.	Brand	Solvent	Specifications	Package Size
34894	Riedel-de Haën	Pentane	min 99%	1 L, 2.5 L
34896	Riedel-de Haën	Acetonitrile	min 99.9%	1 L, 2.5 L

Improved LC/MS Analyses Convenient CHROMASOLV® LC/MS Flush Solution ensures no interferences for high quality MS data.

By Joachim Emmert.....

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The growing use of LC/MS as an analytical tool can be attributed to its ability to provide structural information and detect compounds at extremely low concentration levels. To achieve maximum resolution and sensitivity, the background noise arising from the mobile phase and the sample memory must be eliminated. Sigma-Aldrich's CHROMASOLV® line offers the ideal combination of purity and convenience for all LC/MS applications.

To maintain minimal baseline offset and background noise, it is important to flush the LC/MS system at regular intervals; the

length of the interval depends on the nature of the samples. A commonly employed flush solution is 50% isopropanol in water because it solubilizes both hydrophilic and moderately hydrophobic contaminants. Although this solution can be easily prepared from ingredients found in most laboratories, it is critical to obtain a purity of the flush solution such that it does not add new contaminants to the LC/MS system. To eliminate the possibility of adding contaminants and also reduce the time needed to prepare your own flush solution, we have developed the CHROMASOLV® Flush Solution. This solution comprises a 50% v/v mixture of 2-propanol (isopropanol) in water. Both the 2-propanol and the water are of our highest LC/MS CHROMASOLV® quality. The mixture has been tested for GC and LC/MS purity, water content by Karl-Fischer titration, organic and non-volatile impurities, UV transmittance and levels of sixteen inorganic ions.

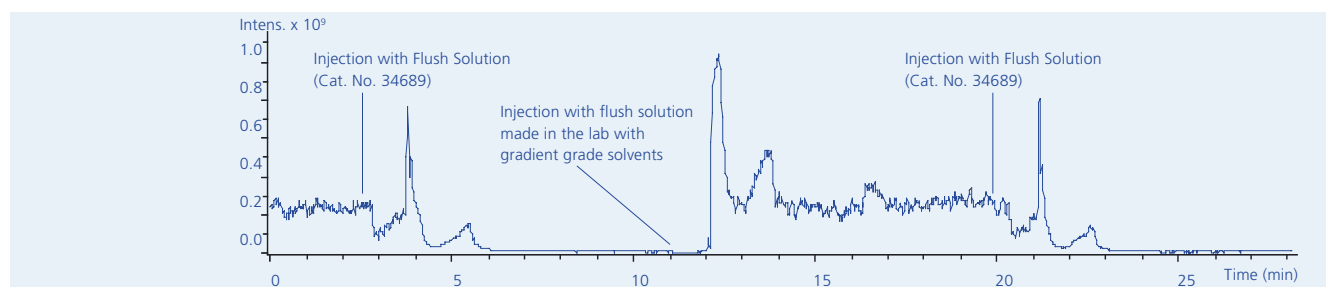


Figure 1 Purity comparison of gradient grade solvents with premixed CHROMASOLV® Flush Solution

Cat. No.	Brand	Name	Package Size
34689	Riedel-de Haën	CHROMASOLV® LC/MS Flush Solution (Water/2-Propanol 50/50 (v/v))	1 L

Table 1 Ordering Information

The data in **Figure 1** presents a clear picture on the effect of purity of flush solution on the quality of the MS chromatogram. The total ion current (TIC) is shown for full scan 100-1000 Dalton obtained with 4 µL/min direct syringe injection (no column) of different 50/50 2-propanol/water mixtures. First, a laboratory mixed solution was used, prepared carefully from gradient grade HPLC solvents. Note the high baseline offset and noise (0-3 minutes). Then, while still scanning, the content of the syringe was changed to the CHROMASOLV® Flush Solution. After the initial disturbance peaks, the baseline obtained with the CHROMASOLV® Flush Solution (6-11 minutes) was at least six-fold

cleaner with far less noise than the gradient grade solvents. To show that this is not a cleaning effect, the process was repeated. The syringe was refilled with the gradient grade solution and injected at 12 min, resulting again in higher baseline and noise (14-20 minutes). Then, the syringe was filled again with CHROMASOLV® Flush Solution and injected at 21 minutes. The flat baseline after 22 minutes confirmed the earlier observation and the purity of the CHROMASOLV® Flush Solution.

Flush solutions are necessary for thorough removal of mobile phase and sample impurities that can interfere with sensitive LC/MS analyses. To ensure your flush solution isn't itself a source of impurities, use CHROMASOLV® Flush Solution. The convenience of the pre-blended mixture and the high purity make it a ideal solution for chemists facing the promises and challenges of both routine and high-throughput LC/MS.

Review: LC-NMR and LC-NMR-MS The next steps in hyphenating analytical techniques.

By Fabian Wahl, PhD
fwahl@sial.com

The increasing pace of research in many fields including proteomics, drug discovery and chemistry has spawned the development of new techniques to resolve complex analytical problems. Decreasing sample volumes together with increasing number of samples, particularly prevalent in HTS and proteomics research, has brought about the need for enhanced sensitivity and automation of analytical methods. Scientists facing these needs have applied two or more analytical methods in series, or hyphenated, to provide synergism and enhanced resolving power and structural information. The resolution achievable by hyphenation is usually much greater than the sum of the individual hyphenated techniques. Besides increasing resolution, or seeing more peaks, hyphenated approaches can also provide more types of information about the sample, i.e. having peaks from the same separation analyzed

analytical method in many fields. One of the drivers for the growth of LC-MS is the burgeoning “-omics” research fields: genomics, proteomics, metabolomics, systemomics, etc. where the fragile, polar, water-soluble sample nature makes separation by LC preferable to GC.

GC-MS and LC-MS are the most common hyphenated analytical techniques, primarily because of the sensitivity and specificity of mass spectroscopy (MS) detectors and the fact that instrument manufacturers have been able to develop efficient interfaces. However, researchers are studying hyphenation of chromatography with every type of detector, including nuclear magnetic resonance spectroscopy (NMR). NMR has two significant benefits over MS detection:

1. NMR provides outstanding stereochemical information.
2. NMR does not need calibration standards for measuring the quantity of an analyte.

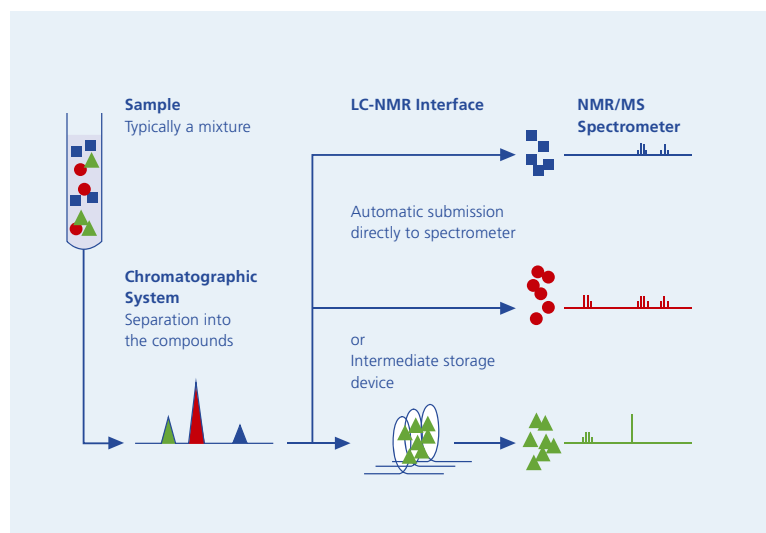


Figure Flow System in LC-NMR/MS (2)

by multiple detectors, each of which is sensitive to different types of molecular structures or orientation. Another benefit is speed and the ability to automate; hyphenating techniques usually avoids the need to collect samples prior to analysis.

It has been thirty years since GC-MS was developed as the first successful hyphenation of a chromatographic method (GC) with a spectroscopic method (MS). Over the last decade LC-MS systems have made great progress; today LC-MS instruments are sophisticated routine instruments in many laboratories. LC-MS, the combination of classic HPLC with MS, has undergone tremendous growth and has become the preferred an-

This latter point is significant and NMR spectroscopy is one of the unique methods from this point of view. The area under an NMR signal is known to be proportional to the number of nuclei that create the signal. Therefore, the ratio of the areas gives the number of nuclei weighted mole ratio of compounds creating the signals. On the basis of this fact, NMR is expected to satisfy the requirements of a primary method of measurement, which is defined by the Comité Consultatif pour la Quantité del Matière (CCQM) under Comité International des Poids et Mesures (CIPM) in Europe. NIST and IUPAC also make “primary method of measurement” distinctions. In order to obtain accurate quantitative results from NMR, the spectrum must have no overlap around the signal to be integrated. By using HPLC to separate mixtures the problem of overlapping signals can be resolved. Therefore LC-NMR is a method to perform International System of Units (SI) traceable quantitative analysis.

These advantages make LC-NMR especially interesting in the separation and structure elucidation of drug impurities, reaction mixtures, degradation products, in vitro and in vivo metabolites and combinatorial library samples in applications like:

- Drug discovery
- Analysis of natural products
- Food and environmental analysis
- Metabolic fingerprinting and metabolomics
- Automated analysis of complex mixtures
- Absolute measurement of organic compounds

However, even with today's ultra high field magnets, the low sensitivity of NMR is still the Achilles heel of this hyphenated technique. Because of this limitation, it is extremely important to keep the concentration of the analyte eluting from the HPLC column as high as possible by reducing band spreading. The choices in HPLC separation mode are also limited by the properties of the NMR instrument. A common HPLC method which works with binary or tertiary solvent mixtures with an isocratic or gradient elution gives rise to very intense signals in NMR from protons in the mobile phase solvents. The NMR spectrometer is unable to handle these intense signals and the low analyte signals at the same time. Therefore in HPLC method development solvents like acetonitrile have to be chosen that have only one signal in the NMR spectrum which could be suppressed.

Mobile phase solvents for high sensitivity analytical applications must be especially pure with the purification process optimized for the specified application. That is, an HPLC solvent has a special low UV-absorbance and a sample preparation LC-MS solvent has guaranteed low contents of cluster forming ionic impurities. A solvent for LC-NMR has to be specified for smallest amounts of additional chemicals as possible, especially since the concentration of the sample molecule is often of the order of 0.001% (m/v) or lower. But scientists will not be satisfied with today's analytical capabilities. The trend is toward increased sensitivity from improvements in instruments, software, detectors and column design. Solvent providers must continually reassess and reformulate their products to ensure they provide minimal interference to maximize sample information. The development, refinement and supply of pure solvents specifically designed for particular detectors are part of a major, on-going research effort by Sigma-Aldrich.

LC-NMR solvents

Sigma-Aldrich, through its Aldrich and Fluka-Riedel de Haën brands provides a number of solvents for LC-NMR in stock for immediate delivery. These products meet rigorous quality control requirements to ensure that you are receiving the best material available. Each solvent is packaged in a heavy-duty GL-45 threaded PYREX, bottle, which conveniently attaches to your LC-NMR instrumentation.

Deuterated solvents

For LC-NMR, the main objective is to decrease unwanted solvent NMR peaks and other proton-containing contaminations to the minimum.

Undeuterated solvents

As separation by HPLC is related to high consumption of solvents, it is advisable to avoid the usage of very expensive deuterated ones when and where possible. Due to specialized decontamination procedure, Riedel de Haen has developed a product to meet the stringent requirements of LC-NMR. Extremely low residue and propionitrile levels, together with very low water levels, make this an ideal choice for your LC-NMR applications.

Table 1 Deuterated solvents

Cat. No.	Brand	Description	Isotopic Purity	Pack Size
53,089-1	Aldrich	Acetone-d ₆	99.9 %	1 L
53,088-3	Aldrich	Acetonitrile-d ₃	99.8 %	1 L
56,310-2	Aldrich	Acetonitrile-d ₃ (contains 15-20% D ₂ O)	99.8 %	1 L
53,086-7	Aldrich	Deuterium Oxide	99.9 %	1 L
53,087-5	Aldrich	Methyl-d ₃ alcohol-d	99.8 %	1 L

Table 2 Undeuterated solvents

Cat. No.	Brand	Description	Suitability of LC-NMR	Pack Size
34955	Riedel-de Haën	Acetonitrile for NMR (CHROMASOLV® line)	Propionitrile (GC): max 0.0002%*	500 mL, 1 L

* There are no further signals in the ¹H-spectrum that exceed the size of the methyl signals found under typical LC-NMR conditions (more than 5% at 3.78 ppm (NMR) of 0.0005% of trimethoxybenzene)

References

- (1) On-line LC-NMR and Related Techniques, edited by Klaus Albert, Wiley (2002)
ISBN: 0-471-49649-9
- (2) Source: Bruker BioSpin GmbH

Chromogenic Media Overview Sigma-Aldrich's Fluka brand offers a broad range of chromogenic media to identify many important microorganisms.

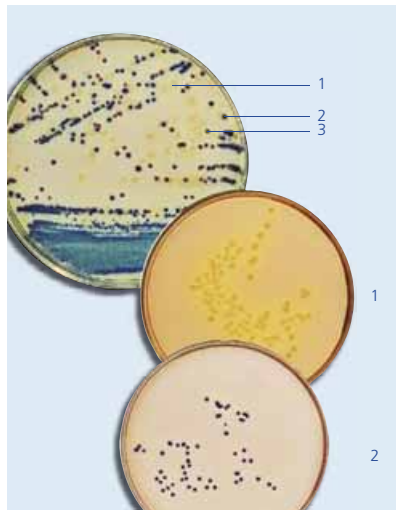


Figure 1 HiCrome ECC Agar:

- 1 *Pseudomonas aeruginosa*
- 2 *Escherichia coli*
- 3 *Klebsiella pneumoniae*

Chromogenic cell culture media is used when there is a need to identify rapidly and reliably the presence of pathogenic microbes in culture. A selective or nonselective media combined with a specific substrate provides improved accuracy and faster detection compared to traditional primary culture media (see Figure 1). Sigma-Aldrich through its Fluka brand is offers you now a new line of chromogenic media designed for specific detection of many of the most important microorganisms. The following table presents an overview of the chromogenic media and the organisms than can

be differentiated. Each medium undergoes specific color changes that depend on the species of microbe present. For example, HiCrome™ *Salmonella* Agar is a selective medium used for simultaneous detection of *Escherichia coli* and *Salmonella sp.* in food or water. *Escherichia coli* and *Salmonella sp.* are easily distinguishable due to the colony characteristics. If present, *Salmonella sp.* gives light purple colonies while *Escherichia coli* has a characteristic blue color. Other organisms give colorless colonies or are inhibited.

•	inhibited	g	green
b	blue	pi	pink
b-g	greenish	pi-r	pink-red
b-pu	blue-purple	pu	purple
bl	black	r	red
bw	brown	sr	salmon-red
cl	colorless	straw	straw
cl-pi	light pink	w	white
f	fluorescent	y	yellow

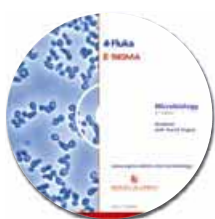
Cat. No.	Brand	Description	<i>Salmonella sp.</i>	<i>Shigella sp.</i>	<i>Escherichia coli</i>	<i>Listeria monocytogenes</i>	<i>Listeria ivanovii</i>	<i>Listeria innocua</i>	<i>Staphylococcus aureus</i>
72953	Fluka	Candida Ident Agar	-	-	•	-	-	-	-
05662	Fluka	HiCrome™ Aureus Agar Base	-	-	-	b	-	-	bw-bl
87959, 81938	Fluka	HiCrome™ Coliform Agar	cl	cl	b	-	-	-	-
95207	Fluka	HiCrome™ <i>Escherichia coli</i> Agar A	cl	-	b	-	-	-	•
70722	Fluka	HiCrome™ <i>Escherichia coli</i> Agar B	cl	-	b	-	-	-	•
73009	Fluka	HiCrome™ ECC Agar	-	-	b-pu	-	-	-	-
89823, 85927	Fluka	HiCrome™ ECC Selective Agar	pi	cl-pi	b	-	-	-	-
52441	Fluka	HiCrome™ <i>Enterococci</i> Broth	-	-	•	-	-	-	•
53707	Fluka	HiCrome™ <i>Listeria</i> Agar Base, modified	-	-	-	b	b	b	-
83339, 88474	Fluka	HiCrome™ Mac Conkey Sorbitol Agar	-	-	pu	-	-	-	-
75605	Fluka	HiCrome™ M-CP Agar Base	•	-	•	-	-	-	-
70641, 87898	Fluka	HiCrome™ MS.0157 Agar	pi	-	b	-	-	-	•
66481	Fluka	HiCrome™ OGYE Agar Base	-	-	•	-	-	-	-
51489	Fluka	HiCrome™ Rapid Coliform Broth	-	-	b-g + f	-	-	-	-
51759	Fluka	HiCrome™ Rapid <i>Enterococci</i> Agar	-	-	•	-	-	-	cl
73318, 78419	Fluka	HiCrome™ <i>Salmonella</i> Agar	pu	-	b	-	-	-	•
16636	Fluka	HiCrome™ UTI Agar, modified	-	-	pi-r	-	-	-	y
P1227	Fluka	Phenolphthalein phosphate agar	-	-	cl	-	-	-	pi-r
84369	Fluka	<i>Salmonella</i> Chromogen Agar	r	y	b-g	-	-	-	•
92435	Fluka	TBX Agar	cl	-	b-g	-	-	-	•

Table Chromogenic media and color changes with various target microorganisms

New Microbiology CD Microbiology Media Data Bank CD

is a valuable tool for all microbiologists.

This CD contains a complete listing of growth media, base ingredients, supplements, reagents, discs, strips and tests for microbiology from Fluka and Sigma brands. An improved and advanced search tool allows you to search for names, synonyms, keywords and the product numbers of Fluka, Sigma and other suppliers as well.



www.sigma-aldrich.com/microbiology_cd

An excellent tool for all microbiologists. You will find a complete Microbiology Media Data Bank on this CD which gives detailed product information, including:

- Product composition
- Directions for use
- Required additives
- Test strains
- Package sizes
- Background information about the application
- References and literature

The detailed product information is printable as a working sheet. A link to our website gives you the prices in your local currency. But you must hurry; the stock of this valuable CD is limited. Please reserve your CD now by registering on-line or returning the enclosed reply card. (Literature Code: HIG)

<i>Candida albicans</i>	<i>Candida glabrata</i>	<i>Candida krusei</i>	<i>Candida tropicalis</i>	<i>Escherichia coli</i> 0157:H7	<i>Klebsiella pneumoniae</i>	<i>Pseudomonas aeruginosa</i>	<i>Citrobacter freundii</i>	<i>Enterobacter aerogenes</i>	<i>Enterobacter cloacae</i>	<i>Enterococcus faecalis</i>	<i>Proteus sp.</i>	<i>Aspergillus niger</i>	<i>Saccharomyces cerevisiae</i>	<i>Clostridium perfringens</i>	<i>Clostridium sordellii</i>	<i>Clostridium bifermentans</i>
g	pi	w	b-g	-	-	•	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	pi	-	sr	-	sr	•	-	-	-	-	-	-
-	-	-	-	-	cl	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	cl	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	pi	straw	-	-	-	-	-	-	-	-	-	-
-	-	-	-	sr	-	-	sr	cl	-	•	-	-	-	-	-	-
-	-	-	-	-	-	•	-	-	b	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	cl	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	•	-	-	-	b	-	-	-	y	dark b	b
-	-	-	-	cl	pi	pi	-	-	-	-	-	-	-	-	-	-
•	-	-	-	-	-	-	-	-	-	-	-	b	cl	-	-	-
g	-	-	-	-	-	-	-	b-g	-	-	-	-	-	-	-	-
-	-	-	-	-	-	•	-	-	-	b-g	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	cl	-	-	-	-	-
-	-	-	-	-	b-pu	cl	-	-	-	b	bw	-	-	-	-	-
-	-	-	-	-	b-g	-	-	-	-	-	y	-	-	-	-	-
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www.sigma-aldrich.com/microbiology

New Product for Petrochemical Industry HYDRANAL® reagents for moisture determination in oils.

By Michael Jeitziner
mjeitziner@sial.com

Sigma-Aldrich has expanded the application range of the **HYDRANAL®**-line of reagents for volumetric and coulometric moisture determination by Karl-Fischer titration to include oils and oily substances. **HYDRANAL®-Solver (Crude) Oil** features unequalled dissolving power; dissolution and dispersion of hydrophobic substances facilitated by xylene and chloroform.

- Moisture determination in oils and other hydrophobic substances
- Unequalled dissolving power
- Fast, clear endpoints
- Accurate at even very low water concentrations
- Meets ASTM D4377-00 requirements

Water Determination of Crude Oil (Laboratory Report L108)

An important prerequisite for reliable and reproducible moisture determination in oils is the complete homogenization of the sample using a homogenizer or by ultrasound. Crude oil requires different solvents to aid solubility; chloroform to dissolve the oil and xylene to dissolve the tar components. If the tar is not finely dispersed it can stick to the electrodes leading to fouling and unreliable response.

In the petrochemical industry the ASTM methods are widespread. Information about the international standards development organization ASTM can be found at www.astm.org.

According to ASTM D 4377-00, in analysis using a pyridine free reagent, a mixture of a Karl Fischer solvent (for example **HYDRANAL®-Solvent**) and xylene must be added to the titration vessel. **HYDRANAL®-Solver (Crude) Oil** (Cat. No 34697) fulfils all these requirements.

Volumetric Determination

30 mL **HYDRANAL®-Solver (Crude) Oil** (Cat. No 34697) are added to the titration vessel and titrated to dryness using **HYDRANAL®-Composite 5** (Cat. No. 34805). Then approx. 4 g sample is weighed accurately into the vessel by difference and the water content titrated using **HYDRANAL®-Composite 5** (Cat. No. 34805).

Table 1 Water determination in crude oil by volumetric and coulometric Karl Fischer titration using **HYDRANAL®** reagents

Oil Sample	Volumetry	Coulometry
900 OK 76-69	0.15%	0.15%
586 BP 90-63/81	0.13%	0.13%
751 OK 142-55	0.08%	0.08%
835-EJ 52-12	0.18%	0.18%
875-OK 992-63	0.31%	0.32%
885-NN 791-12/24	0.05%	0.04%

Coulometric Determination

In the coulometric cell with a diaphragm 5 mL **HYDRANAL®-Coulomat CG** (Cat. No. 34840) is added to the cathode chamber and up to the same level approx. 100 mL **HYDRANAL®-Coulomat Oil** (Cat. No. 34868) to the anode chamber. Instead of **HYDRANAL®-Coulomat Oil** a mixture of 70 mL **HYDRANAL®-Coulomat A** (Cat. No. 34807) and 30 mL Xylene (Cat. No 37866) could also be used.

Using both volumetric and coulometric methods, six different oil samples were analyzed for moisture using **HYDRANAL®** reagents. The data presented in **Table 1** shows consistent results between the two methods.

Table 2 **HYDRANAL®** products for moisture determination in oil

Cat. No.	Brand	Product	Application	Pack size
Volumetric Det.				
34805	Riedel-de Haën	HYDRANAL®-Composite 5	Titrant (one component-reagent), 1 mL = approx. 5 mg H ₂ O	500 mL, 1 L, 2.5 L, 5 L
34697	NEW! Riedel-de Haën	HYDRANAL®-Solver (Crude) Oil	Solvent for oils and oily samples, to use with HYDRANAL®-Composite for titration of oils	1 L, 2.5 L
Coulometric Det.				
34868	Riedel-de Haën	HYDRANAL®-Coulomat Oil	Anolyte for titration of oils	100 mL, 500 mL
34807	Riedel-de Haën	HYDRANAL®-Coulomat A	Anolyte for cells with diaphragm reagent contains chloroform	500 mL
34840	Riedel-de Haën	HYDRANAL®-Coulomat CG	Catholyte, free of halogenated hydrocarbons 25 mL bottle resp. 10 x 5 mL ampoules	25 mL, 50 mL
34828	Riedel-de Haën	HYDRANAL®-Water Standard 1.00	Standard for coulometric Karl Fischer titration (1 g contains 1 mg = 0.1 % H ₂ O Traceable to NIST SRM 2890)	40 mL
37866	Riedel-de Haën	HYDRANAL®-Xylene	Solubilizer, max. 0.01 % water	1 L

The HYDRANAL® Team Expertise, competent technical support and high quality reagents make a winning combination.

By Helga Hoffmann
hoffman@europe.sial.com

HYDRANAL®-Products

Karl Fischer Titration is a widely-used method for moisture determination. Researchers at Sigma-Aldrich's Riedel-de Haën division in Germany began in the 1980's to update the Karl Fischer technique, improving its ease of use, safety and reliability. These improvements became the basis of the HYDRANAL® family of Karl Fischer reagents. Since then, Riedel-de Haën has become the world leader in the supply of pyridine-free Karl Fischer Titration reagents. Over 25 years of concerted R&D has resulted in more than 50 different HYDRANAL® reagents covering nearly all application areas.

HYDRANAL®-Support Team

Because the HYDRANAL® line is so extensive, we know that getting started can be confusing. Plenty of samples to be investigated require troubleshooting. Benefit from our vast experience in Karl Fischer titration! Our HYDRANAL®-Laboratory has investigated hundreds of problem products and worked out suitable applications and troubleshooting protocols. This experience combined with the knowledge obtained during reagent development, will minimize your frustration and maximize your success with HYDRANAL® applications.

Our Total Technical Support includes:

- Advice in selecting the appropriate HYDRANAL® Karl Fischer reagent
- Help in solving technical problems
- Analysis of problem samples
- Complete, custom method development service
- Regular Karl Fischer workshops and seminars
- MSDS and Certificates of Analysis
- Comprehensive literature and applications for problem samples

Take advantage of the knowledge of our resident experts. Please contact us:

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E-mail: dclark@sial.com
Phone: 1-800-HYDRANAL®

Europe and Rest of the World

Ms. Helga Hoffmann
E-mail: hhoffman@europe.sial.com
Phone: +49 (5137) 8238-353

HYDRANAL®-Literature

Our comprehensive literature and application library on our website, www.sigma-aldrich.com/hydranal, makes daily work easier for HYDRANAL®-Users, and is always available anytime you need it. Following is a list of some relevant HYDRANAL®-Literature available today:

Analytix Notes

- Extended information on some current topics.
- Analytix Notes Product Line Overview (HRM)
 - Analytix Notes ISO 9000 and Karl Fischer Titration (HDG)

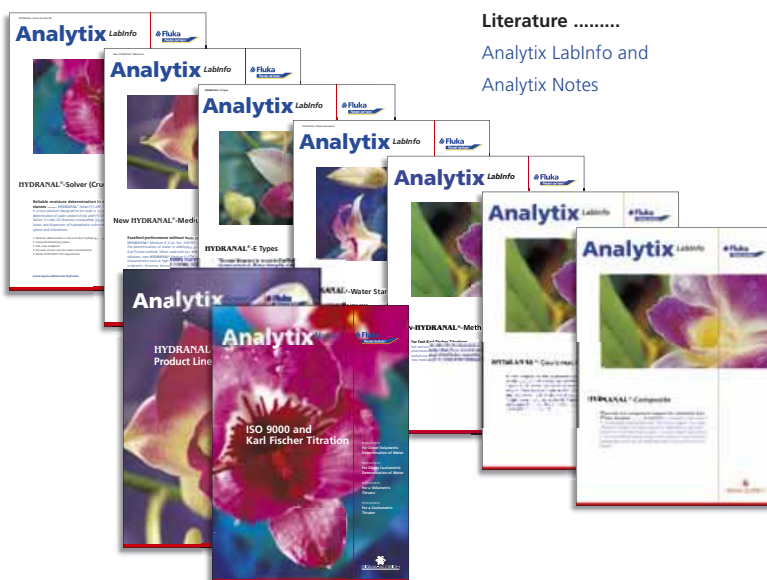
Analytix LabInfos: Applications

Short literature pieces containing concise information about specific products and applications.

- Analytix LabInfo HYDRANAL®-Solver (Crude) Oil (HTL)
- Analytix LabInfo HYDRANAL®-Medium K (HTK)
- Analytix LabInfo HYDRANAL®- E-types (HNV)
- Analytix Lab Info HYDRANAL®-Water Standards (HGS)
- Analytix LabInfo New-HYDRANAL®-Methanol Rapid (GXJ)
- Analytix LabInfo HYDRANAL®-Coulomat Oil (GXI)
- Analytix LabInfo HYDRANAL®-Composite (GXH)

Survey for Karl Fischer Titration

Our objective is to offer you superior service and the most up-to-date products to meet your analytical needs. Please help us meet this objective by completing a short survey at www.sigma-aldrich.com/hydranal_survey. To show our appreciation, we will send you a complete collection of HYDRANAL® literature or the new HYDRANAL® -Multimedia Guide CD upon completing the survey.



Literature
Analytix LabInfo and
Analytix Notes

www.sigma-aldrich.com/hydranal

New AQUANAL® Brochure Learn about Sigma-Aldrich's premiere line of kits and reagents designed for water analysis in this new, informative and instructional brochure.



Picture

Aquanal Brochure
(Literature Code GZE,
available in English
and German language)

The AQUANAL® family comprises ready-to-use test kits (photometric, colorimetric and titrimetric), as well as compact labs and photometers for the rapid analysis of natural, drinking, feed, process and waste waters. AQUANAL® tests rely on simple, well-characterized chemical reactions that form colored compounds as products. If any of the reactants are missing, the color change does not occur. Because the color change is stoichiometric, the intensity of the color correlates to the concentration of the reactants. Detailed instructions make it simple to use for both laboratory and field applications. AQUANAL® products are backed by Sigma-Aldrich's reputation for quality, service and support.

The new AQUANAL® brochure contains information on the various AQUANAL® product lines:

- AQUANAL® professional
- AQUANAL® plus
- AQUANAL® Compact Labs
- AQUANAL® Photometers
- QUANTOFIX® Test Sticks and Test Kits

As well useful instructional information about water analysis, including:

- AQUANAL® and QUANTOFIX® Quick Look-up Table
- Description of Water Quality Parameters and Water-Born Substances
- Principles behind AQUANAL®
- Types of substances in water that can be analyzed using AQUANAL®
- Types of water samples that can be analyzed using AQUANAL®
- Types of water samples that are difficult to analyze with AQUANAL®
- Primary industries using AQUANAL®

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www.sigma-aldrich.com/aquanal_brochure

New Product Corner Superior quality Fluka pH electrodes at a very attractive price.

Cat. No.	53162	30948	57458
Brand	Fluka	Fluka	Fluka
Description	Laboratory pH electrode	pH Stick-in electrode	Universal pH electrode for online measurements
Features	Precise and reliable pH measurement	For stick-in measurements of meat, cheese, bread and other semisolid food	Very robust pH electrode, especially used for online measurements waste water, galvanic baths, etc.
Measuring range	pH 0 to 14	pH 0 to 14	pH 0 to 14
Operating range	0-100°C (32-212°F)	0-60°C (32-140°F)	0-100°C (32-212°F) at max. 6 bar
Reference electrolyte	Refillable, KCl (3 mol/L), Ag ⁺ free	Polymer gel, blue-dyed	Polymer gel
Reference system	Ag/AgCl cartridge	Ag/AgCl	Ag/AgCl cartridge
Internal buffer	pH 7.0±0.25	Solid, pH 7.0±0.25, blue-dyed for finding glass splinters should electrode break	pH 7.0± 0.25
Membrane shape	Cylindrical	Spear	Cylindrical, high-temperature pH glass
Membrane resistance (25°C)		Approx. 100 MΩ	
Shaft material	Glass	Glass	Glass
Electrode plug	S7	S7	S7 with PG 13,5 threaded port
Diaphragm	Ceramic (self-cleaning)	Hole and ceramic	Hole and ceramic
Application	General applications	Food applications	On-line or in-process measurements in a wide range of applications

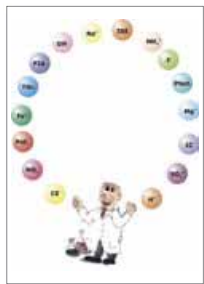
Table

These new Fluka electrodes provide superior quality, impressive performance and excellent chemical resistance at very competitive

prices. Configurations are available to meet a wide variety of pH measurement applications.

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Upcoming events CIA Conference on Ion Chromatography and HYDRANAL® seminar series.



Picture
CIA Conference

CIA Conference on Ion Chromatography Visit us at CIA 2005

Conference on Ion Analysis, Berlin,
6th - 8th April 2005

Visit the Sigma-Aldrich booth to see our comprehensive line of products for ion analysis and ion chromatography including ionophores for sensoric applications, **IDRANAL®** reagents for complexometric titration, certified ion chromatography standards, PRIMUS (Primary Multi-ions Standards for Ion Chromatography) and many others.

Sigma-Aldrich researchers will also be presenting the following plenary lectures during the symposium:

- "Full visibility for the detector – requirements for reagents for mass spectrometry", by Fabian Wahl (Fluka Chemie AG, Switzerland)
- "About traceability, uncertainty, 5N-materials and other myth" by Michael Weber, (Fluka Chemie AG, Switzerland).

Sigma-Aldrich offers in addition a half day workshop "Reference materials and measurement uncertainty in practice". The workshop is scheduled to the 7th of April, from 14.00 to 17.00.

Participation is free of charge and the workshop has the following preliminary topics:

- A ramble through the world of reference materials
- Status quo of chemical analysis approached by a "top-down" view
- Determination of measurement uncertainty and how (not) to handle with it
- Case study in doping control: finding guilty or not – the decision is up to you!

For registration and additional information, please contact:

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www.cia-conference.com

HYDRANAL®-Seminars

HYDRANAL® is Sigma-Aldrich's premiere line of reagents for pyridine free moisture analysis by Karl Fischer titration. As a service to the scientific community, we routinely offer seminars to provide training on the chemistry behind the technique and information specific to the HYDRANAL® line. Following is a list of upcoming seminars:

Picture Karl Fischer Titration



When

Where

April	19 th	Hamburg, Germany
April	26 th	Leipzig, Germany
May	10 th	Halle, Germany
May	24 th	Milan, Italy
May	26 th	Rome, Italy
June	6 th - 9 th	Spain

For registration and additional information, please contact:

Ms. Helga Hoffmann

E-mail: hhoffman@europe.sial.com

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